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ABSTRACT

A study tested the effects of timed versus untimed practice using text passages containing inserted adjunct questions. These effects were measured in terms of performance on repeated, related, and unrelated test questions. Subjects were 47 college students in Florida randomly assigned to one of two groups. One group was allowed a fixed amount of time to complete the practice, while the other group was allowed an unlimited time to complete the same practice. Results indicated that the time factor did not have a significant impact upon scores across the three types of test questions. (One table of data is included.) (Author/RS)

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The Effects of Adjunct Questions on Learning Text Material: The Time Factor

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Abstract

The purpose of this study was to test the effects of timed versus untimed practice using text passages containing inserted adjunct questions. These effects were measured in terms of performance on repeated, related, and unrelated test questions. Forty-seven college students were randomly assigned to one of two groups. One group was allowed a fixed amount of time to complete the practice, while the other group was allowed an unlimited amount of time to complete the same practice. Results indicated that the time factor did not have a significant effect upon scores across the three types of test items ($p > .05$). Features of the experimental treatment that may have contributed to these results are discussed, along with implications for future research.

The Effects of Adjunct Questions on Learning Text Material: The Time Factor

The effects of adjunct questions on prose learning has been a common focus of many research studies. Adjunct questions are questions which have been added to instructional text to influence what is learned from the text. Although much research has been done to study differences in effects of adjunct questions under various conditions, the effect of study time in adjunct question research has been given little attention (Hamaker, 1986). In fact, inadequate attention to the study time variable has been cited as a major problem with much of the available research (Faw & Waller, 1976).

It has been suggested that the positive effects of adjunct questions upon text processing might be accounted for by the extra time required to answer the adjunct questions (Hamaker, 1986). It was found that when students were induced to spend more time on the task by means other than adjunct questions, the results were the same as when using the adjunct questions themselves (Peeck, 1970). One way to isolate the effects of time in adjunct question research is to see if results vary in relationship to whether time is fixed or left free.

The purpose of this study was to test the effects of study time (Time Fixed versus Time Free) in text learning using adjunct questions. These effects are measured in terms of performance on repeated, related, and unrelated test questions.

In order to help explain how time might affect text learning using adjunct questions, it is first necessary to define some specific components within adjunct question research. One of these components is the type of adjunct question that is used. A type of adjunct question that is commonly employed is the inserted postquestion. Inserted postquestions are questions placed within text and that follow the text passage containing the information needed to answer them. This particular type of adjunct question has been found to produce two types of learner processing effects: a backward effect and a forward effect. The backward effect is a result of the learner's mental review of previously read material. The forward effect, however, is a result of a change in the learner's processing strategy on subsequent text passages as guided by the type of question previously asked. In other words, adjunct questions are said to have a forward effect when they result in the learner selectively attending to a specific type of information as it appears in subsequent text passages (O'Kon, 1988).

The forward effect of adjunct questions can be classified into two types: a specific forward effect and a general forward effect (Rickards, 1979). The specific forward effect is due to the learner's selective attention towards questioned material, whereas the general forward effect is due to an increase in the learner's overall attention to all information (Rickards, 1979). Each effect can produce different results in performance on posttest questions, depending on whether the test item was designed to measure learning of relevant or incidental material.

Another component within the research that needs clarification is the type of learning that is being measured after the student's completion of the

adjunct questions task. A distinction between relevant and incidental learning is a commonly used dichotomy in the literature (Anderson & Biddle, 1975). Relevant learning may be measured by performance on both repeated and related questions on a posttest. Repeated questions are test questions encountered previously by the subjects as adjunct questions. Related questions are test items that are related to or that correspond to a particular adjunct question, but are not the same as the adjunct question, and, therefore, are new to the learner. Incidental learning, on the other hand, is measured by performance on unrelated questions on a posttest. Unrelated questions are test items that are not related to any adjunct question, but are related to a previously read text passage.

Although it has been stated that the effect of postquestions enhance both relevant (question-related) learning and incidental (question-unrelated) learning (Duchastel, 1983), there was an absence of this effect upon unrelated test items in a review compiled by Hamaker (1986). It is well-established in the literature that inserted postquestions have a sizable facilitative effect on repeated test items, as well as a positive effect on related test items, although to a lesser degree (see Hamaker, 1986, for review). However, not only is there lack of confirmation that inserted postquestions have a facilitative effect on incidental learning, there have been slightly negative effects produced on unrelated test items (Duchastel & Nungester, 1984). It has been suggested by Hamaker (1986) that the crucial design feature causing this negative effect on unrelated test items was fixed study time.

It was hypothesized that (1) students in the Time Fixed group would perform better than students in the Time Free group on repeated posttest questions, (2) students in the Time Fixed group would perform better than students in the Time Free group on related posttest questions, and (3) students in the Time Free group would perform better than students in the Time Fixed group on unrelated posttest questions. Previous research supports these hypotheses. In Hamaker's review of previous adjunct question studies (1986), the positive effects of adjunct questions on repeated test items were greater when study time was fixed than when no time limit was imposed. Since related test items are related to repeated test items, it would be expected that fixed study time would result in positive effects of adjunct questions on related test items as well. Conversely, past adjunct question research has shown that the experimental condition of leaving time free yields a consistent positive effect on unrelated test questions (Hamaker, 1986).

The theory behind the hypotheses may be explained as follows. When time is left free, both the specific and general forward effects come into play, leading to an overall improvement on all types of test questions. But when time is fixed, there is a shift of attention away from unrelated to related text information, thus preventing the general effect from occurring (Hamaker, 1986).

An additional rationale supporting the hypotheses is that the total amount of attention a learner brings to bear on a reading task is both a function of duration and intensity (Reynolds & Anderson, 1982). Levels of duration and intensity tend to be inversely related (Reynolds & Anderson,

1982). When time is left free, the student's task intensity level is lower, but task time duration is longer. When combined with the assumption that an increase in effort is always time-consuming (Reynolds & Anderson, 1982), the longer duration allows for the general effect to occur, improving learning of unrelated information. However, when time is fixed, task time duration is shorter, but the student's task intensity level is higher. Higher intensity allows the specific effect to occur, improving learning of repeated and related information.

Method

Subjects

The subjects used in this study were 47 undergraduate education majors (7 males and 40 females) enrolled in a course entitled Schooling in American Society taught at Florida State University, Tallahassee. The class was composed predominantly of white students (45 Caucasian and 2 non-white) of average middle-class socioeconomic background. Participation in the study was voluntary. Those students who had previously completed or were concurrently enrolled in any class of Educational Psychology were noted, since the study materials used in the study were from this subject area and previous exposure could confound results.

Materials

The materials consisted of 10 passages of text material taken from a college-level introductory psychology textbook (Papalia & Olds, 1985). Each passage was 200 to 250 words in length and appeared on a separate

page. One multiple-choice question was inserted on a separate page following each passage. These inserted questions required the recall of verbal information from the passages. No feedback was provided. All 10 passages and questions were bound into booklet form.

A 30-item posttest was designed to include three types of multiple-choice questions. Repeated questions were simply the same inserted adjunct questions that appeared between the text passages in the booklet. Two other types of questions (related and unrelated), however, were new to the students. Related questions were new questions that focused on some related aspect of the original adjunct question. Unrelated questions were new questions that were not related to a specific topic found within the adjunct question, but were related to some other topic within that particular passage. There was one question of each type (repeated, related, and unrelated) per passage. All three types of questions measured recall of verbal information. The reliability coefficient for the total test was .67.

Procedure

Subjects were randomly assigned to two groups: time free and time fixed. Each group met in separate classrooms. All subjects received the practice booklet containing the passages and adjunct questions, and a separate answer sheet to record their answers on. Students were not allowed to look back at the passage to answer the question. The same materials were given to each of the groups except for variations in instructions according to whether the group was timed or untimed. The time free group was given an unlimited amount of time to complete each

passage and question in the booklet. Each student's total completion time was recorded by the administrator. The time fixed group, however, was given only 88 seconds to read a passage and answer a question. This allotted time estimate was established from results of a pilot test designed to measure approximate time to complete the task. The approximate average time from the pilot test was then slightly lessened. After each 88-second allotment for reading the passage and answering the question, the administrator called time, and all students in the time fixed group proceeded to the next passage and question.

After the practice booklet was completed in each group, students were given the posttest. Students were allowed an unlimited amount of time to complete the test, regardless of which group they were in. Students were not allowed to look back to the practice booklet during the test.

Results

The time required for students in the time fixed group to complete the practice booklet was 16 minutes and 28 seconds. The average time required for the students in the time free group to complete the practice booklet was 16 minutes and 40 seconds, with a range from 11 minutes to 31 minutes.

Posttest scores were summarized, and four separate scores were recorded for each subject: a repeated questions score (number of repeated items answered correctly), a related questions score (number of related items answered correctly), an unrelated questions score (number of unrelated items answered correctly), and a total score (total number of

items answered correctly). Four separate one-way analyses of variance were conducted on each of the four separate scores. Table 1 shows the mean scores and standard deviations for each treatment group on the three dependent measures and on the overall test.

Insert Table 1 about here

With alpha set at .05 for all statistical tests and an average sample size of 23 subjects per group, the power for detecting a moderate effect size was .83 for repeated posttest items, .75 for related posttest items, .32 for unrelated posttest items, and .85 for the total test.

Possible violations of assumptions were checked. Visual inspection of the data indicated no obvious violations of the normality assumption. In addition, results from the Cochran C test for homogeneity of variance suggest that the variances were homogeneous across groups, $p = .96$.

Results on repeated questions showed that the time free group answered more questions correctly than did the time fixed group, although this difference was not statistically significant, $F(1, 45) = 2.35$, $p > .05$. The hypothesis that the time fixed group would perform better than the time free group on repeated questions was not supported.

Similar results were found on related questions. The time free group answered more questions correctly than did the time fixed group, although this difference was not statistically significant, $F(1, 45) = 1.83$, $p > .05$. The hypothesis that the time fixed group would perform better than the time free group on related questions was not supported.

Results on unrelated questions showed that the time free group answered more questions correctly than did the time fixed group. This difference, however, was not statistically significant, $F(1, 45) = 0.57$, $p > .05$. The hypothesis that the time free group would perform better than the time fixed group on unrelated questions also was not supported.

Discussion

Since differences between repeated, related, and unrelated questions were not significant, it could be concluded that the factor of time is not an important one in adjunct question studies. Before concluding this, however, it is important to note several factors within this study that may have contributed to these results.

The actual average amount of time taken for each group to complete the practice session was almost identical (time free -- 16 minutes, 40 seconds; time fixed -- 16 minutes, 28 seconds). The time fixed group was given too much time to complete the practice. In order to truly test our hypotheses, the time allowed for the time fixed group should have been substantially reduced.

The format of the adjunct questions and test questions could have influenced the results, as well. The format of the adjunct and posttest questions used in this study was multiple-choice. In a previous review by Anderson & Biddle (1975), it was found that the effect of adjunct questions is strongly influenced by the format of the questions. Short-answer questions were found to have an average effect that was two and a half times as large as multiple-choice questions. Perhaps the smaller effect in

this study was influenced by the format of the questions used. If short-answer questions, rather than multiple-choice, had been used, the effects may have been greater.

An additional reason why significant differences were not found may be due to the small sample size used in the study. Using a larger number of subjects would have increased the power of our tests. In other words, we may not have not had sufficient power to detect differences between groups.

The time factor is an important issue in adjunct questions research, based on findings in Hamaker's (1986) review. Although this study failed to produce significant findings to support our hypotheses, we believe that results would be different if the previously mentioned changes were made. Future researchers conducting studies in this area should be careful to substantially limit the amount of time given to the timed group.

It is suggested that this study be replicated, with careful consideration to the factors cited here. It is quite possible that the factor of time, when adequately controlled for in adjunct question research, will have significant effects on various learning outcomes.

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Table 1

Means and Standard Deviations of Posttest Scores by Question Type and Group

	Question type			
Group	Repeated max=10	Related max=10	Unrelated max=10	Total max=30
Time fixed	6.3	5.9	6.1	18.3
n = 24	(2.1)	(1.8)	(1.4)	(4.1)
Time free	7.2	6.6	6.4	20.1
n = 23	(2.1)	(1.4)	(1.4)	(4.1)

Note. Numbers in parentheses are standard deviations.